

# **Space Shuttle Orbiter and Component Handling**

**Mike Kelemen**

**October 12, 2005**

# Introduction

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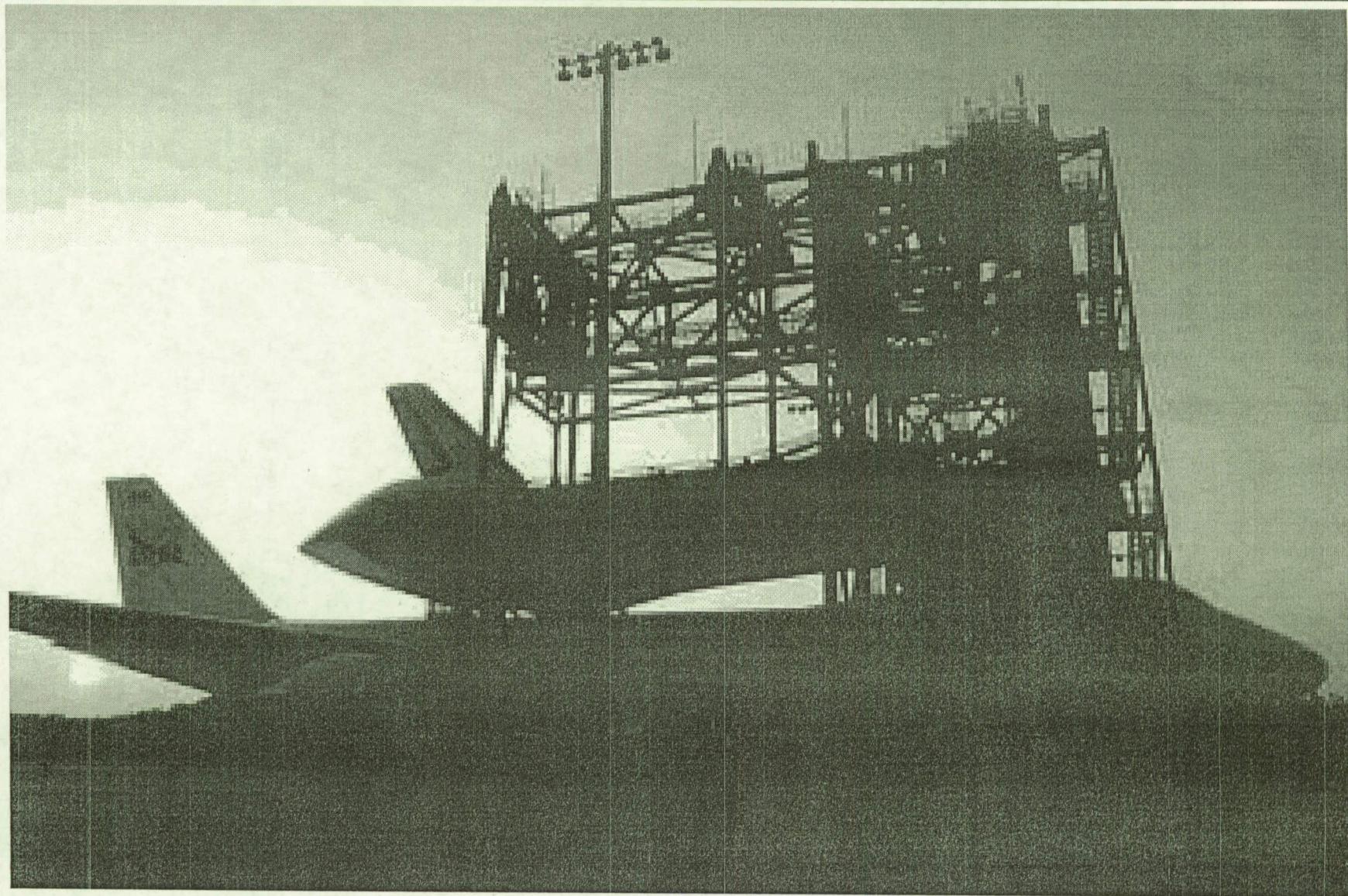
- Who am I?
  - 17 years in Orbiter Handling Engineering group at United Space Alliance (formerly with Lockheed)
- What do I do?
  - Responsible for procedures
  - Responsible for flight hardware handling policy
  - Serve on Move Director Guidance Committee

# Overview

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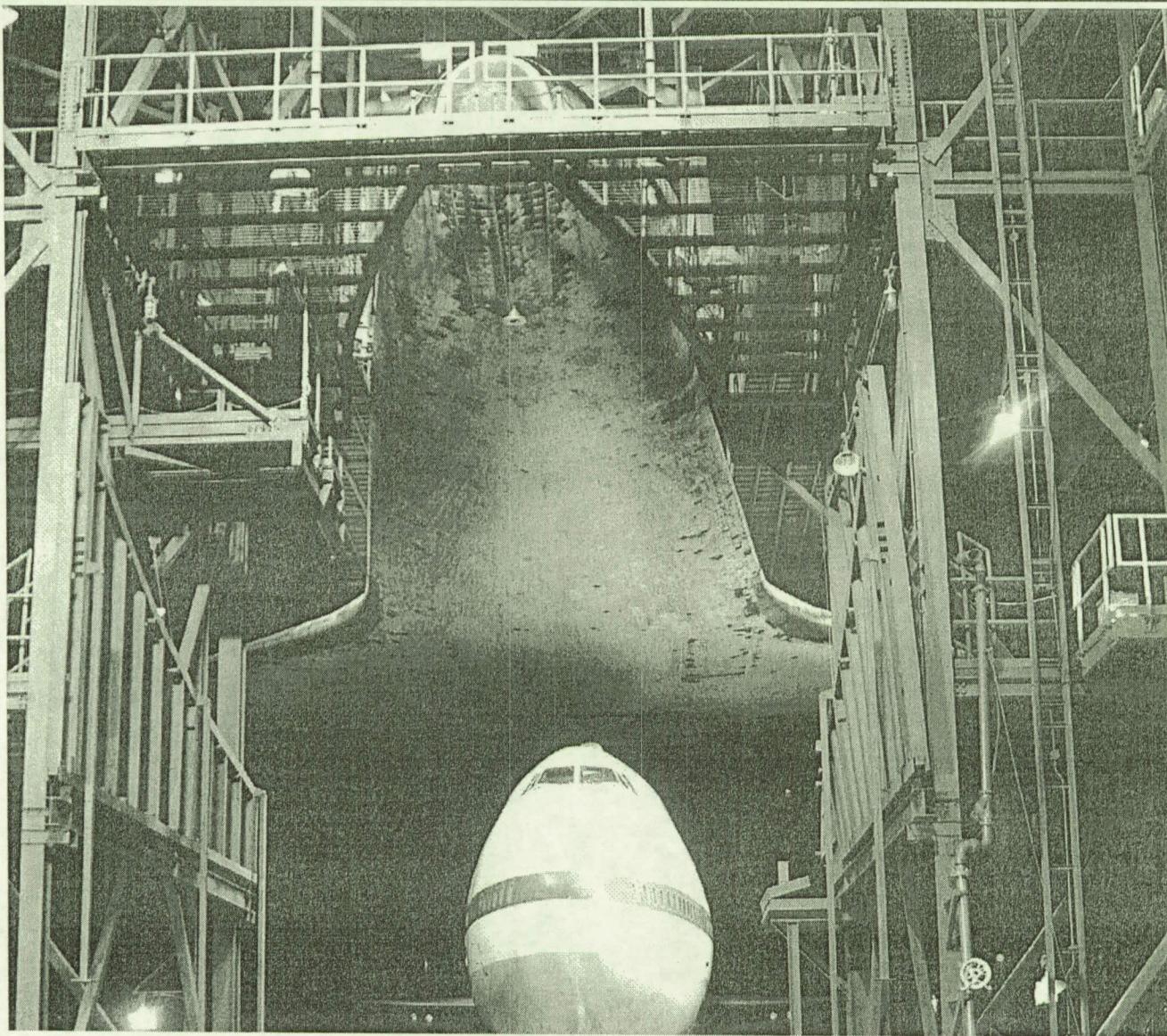
- **Types of moves we do**
  - Single crane lifts
  - Dual crane lifts
  - Transportation
- **Issues and incidents we have had**
- **Our policies**
- **Move Director Oversight and Guidance Committee**
- **Move director proficiency and training**
- **Questions?**

# Dual Crane Lifts

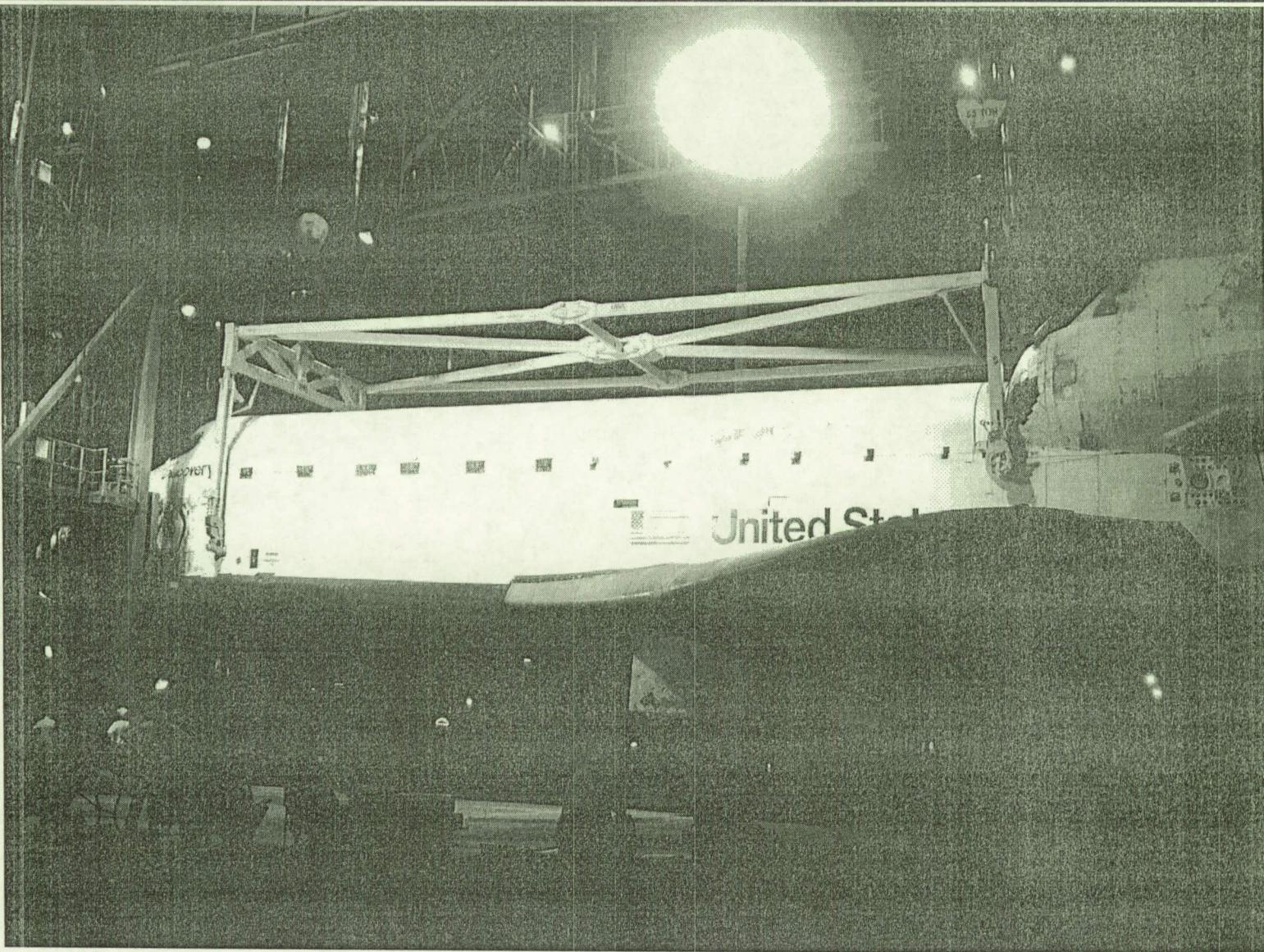


# Dual Crane Lifts

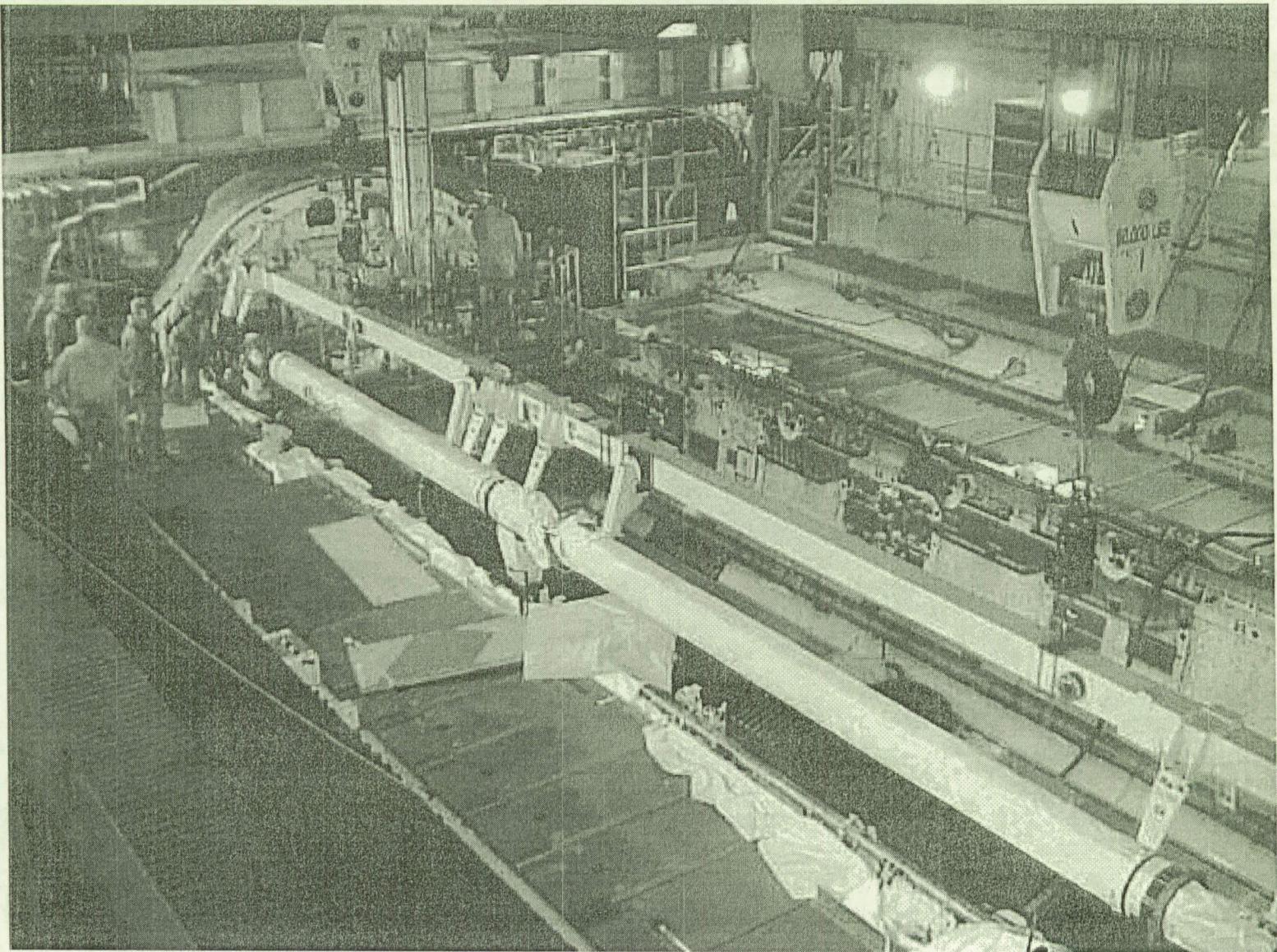
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# Dual Crane Lifts

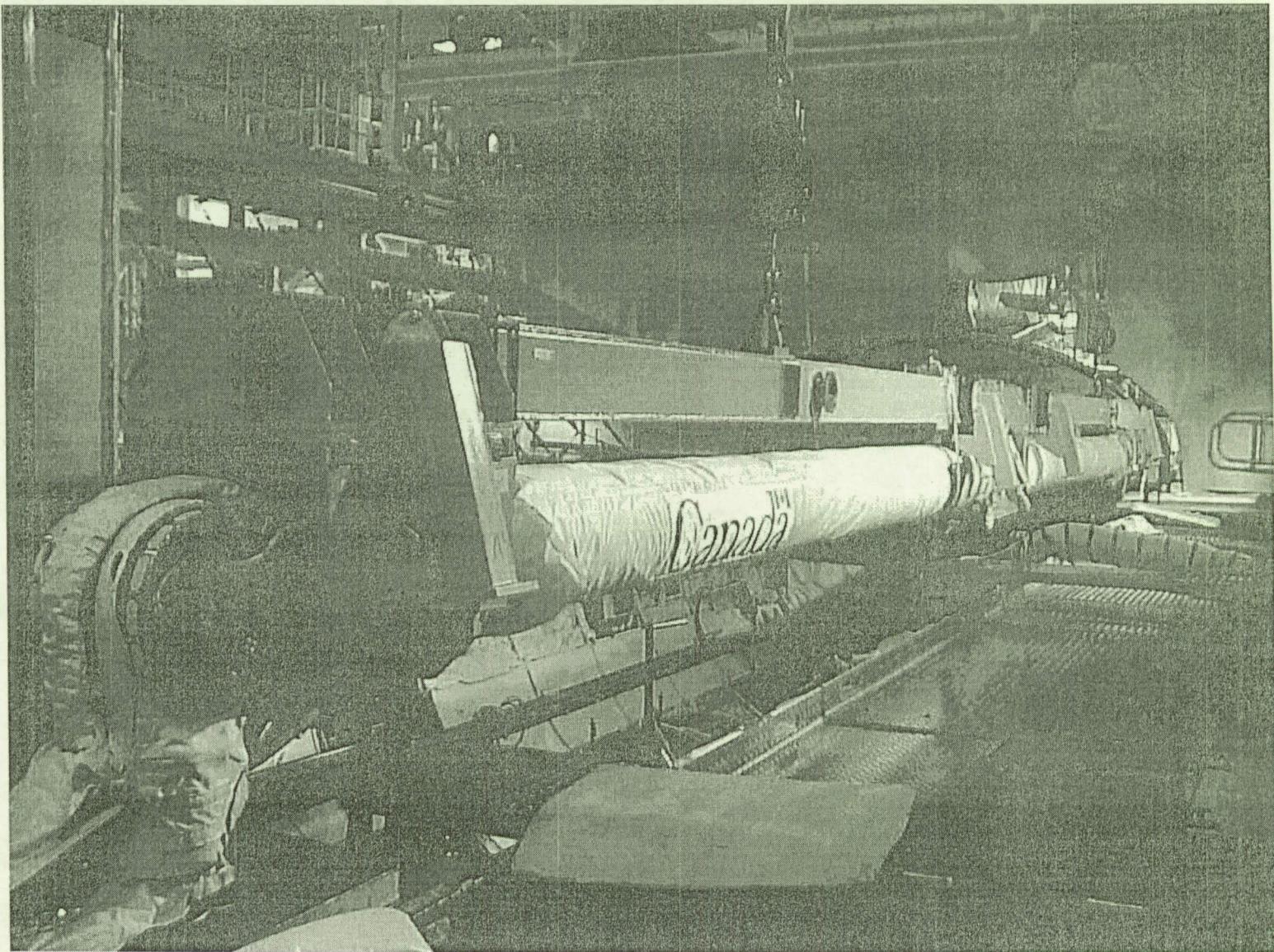


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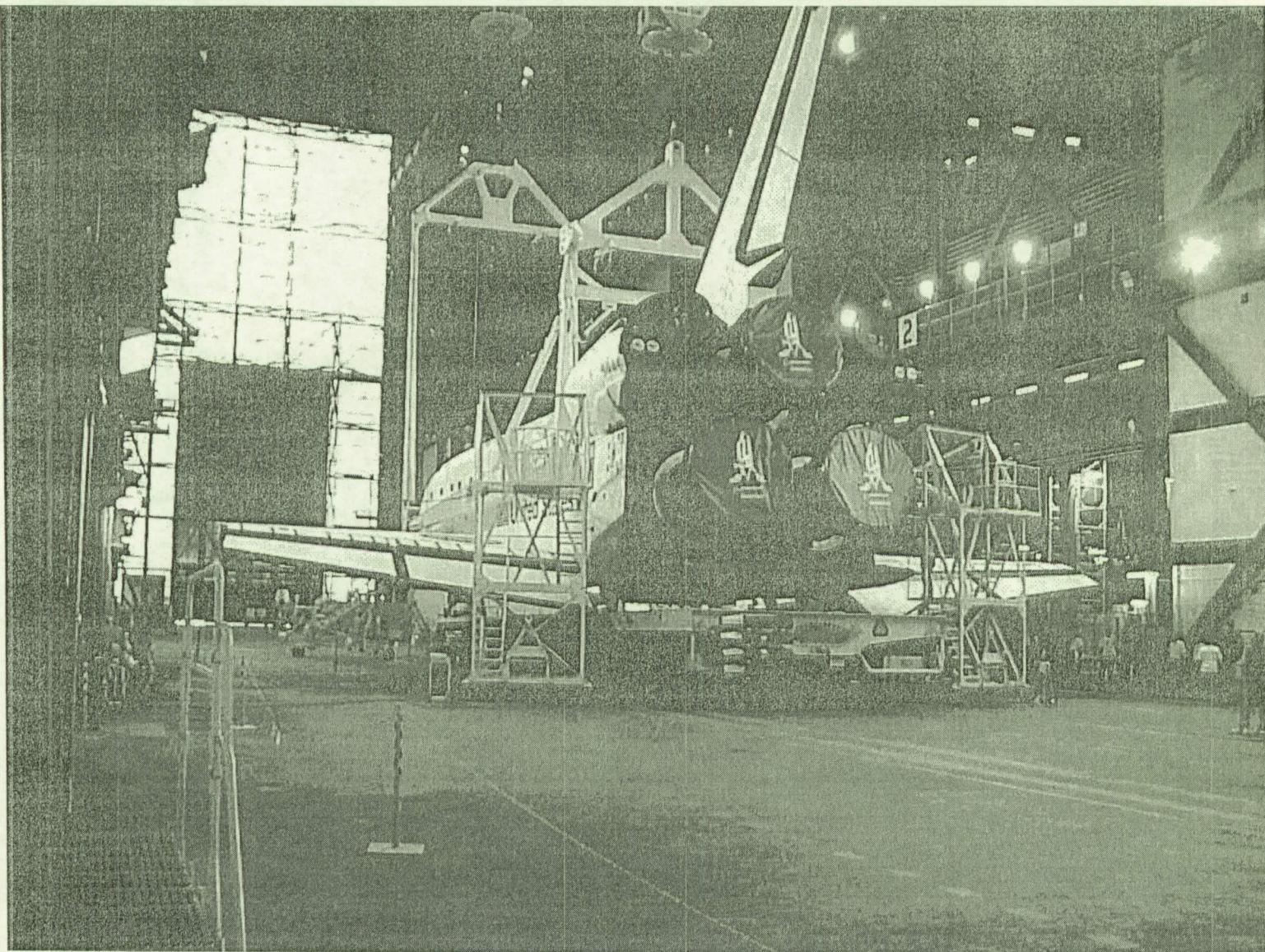


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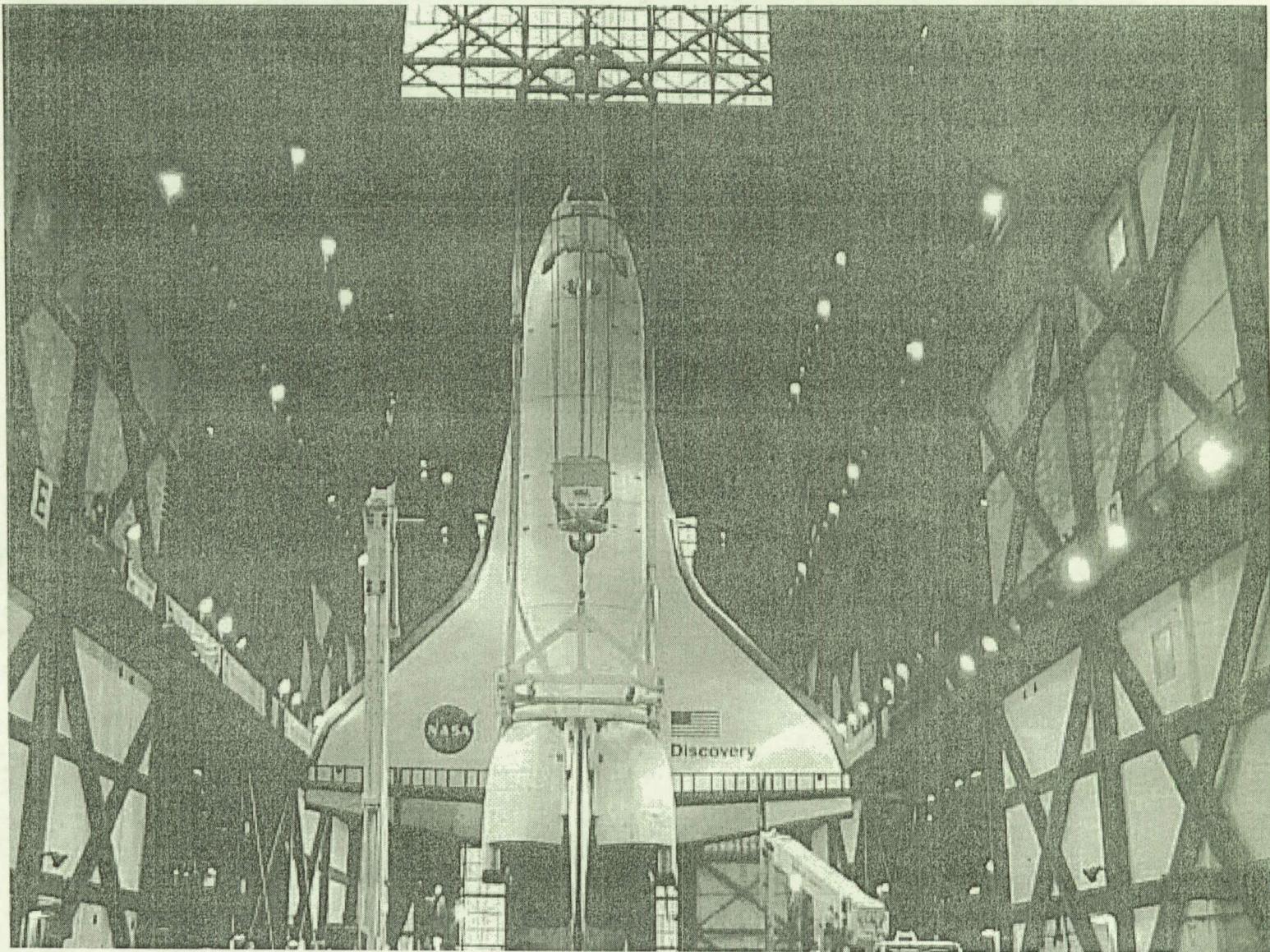
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# Dual Crane Lifts

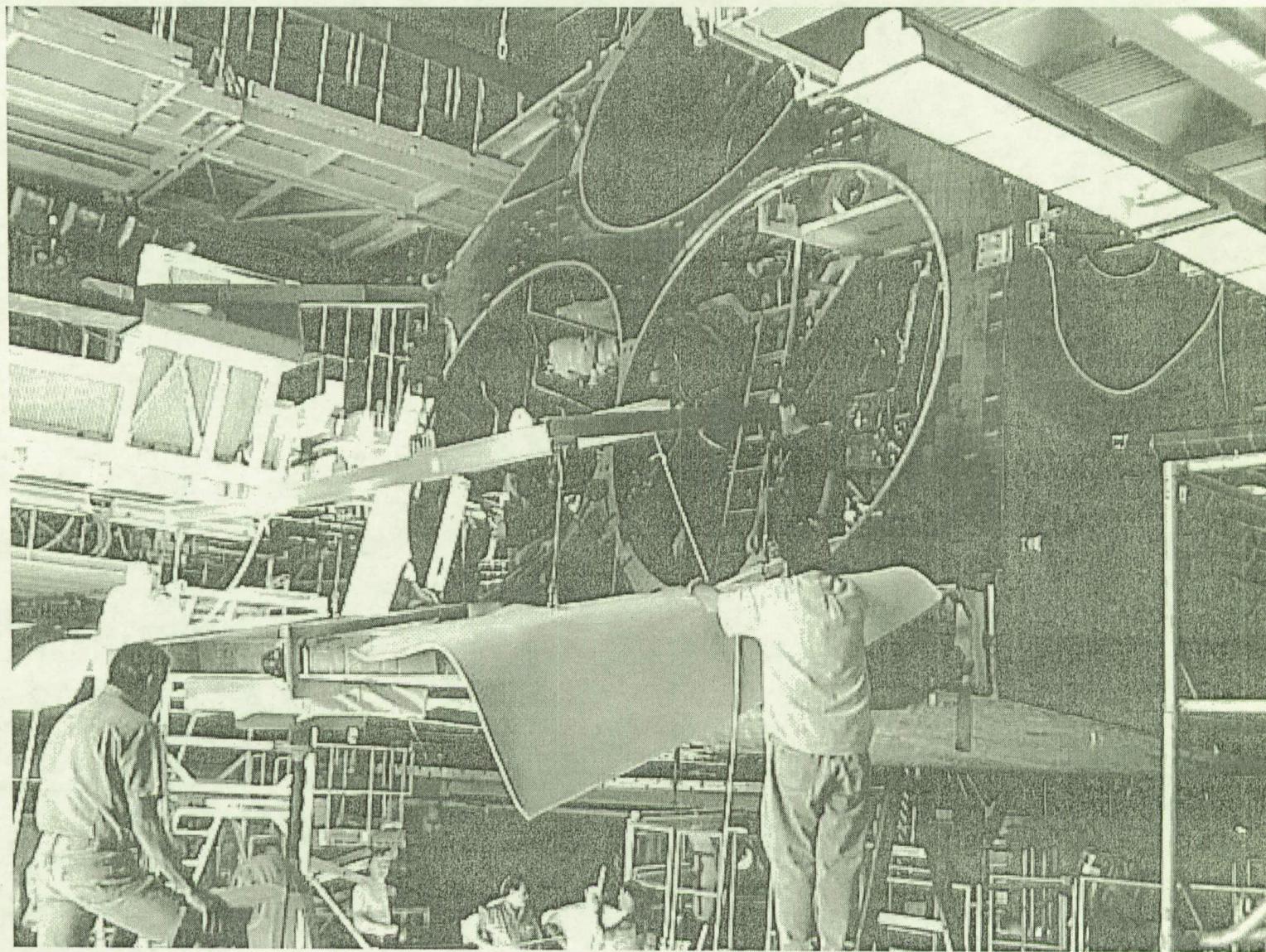


# Single Crane Lifts

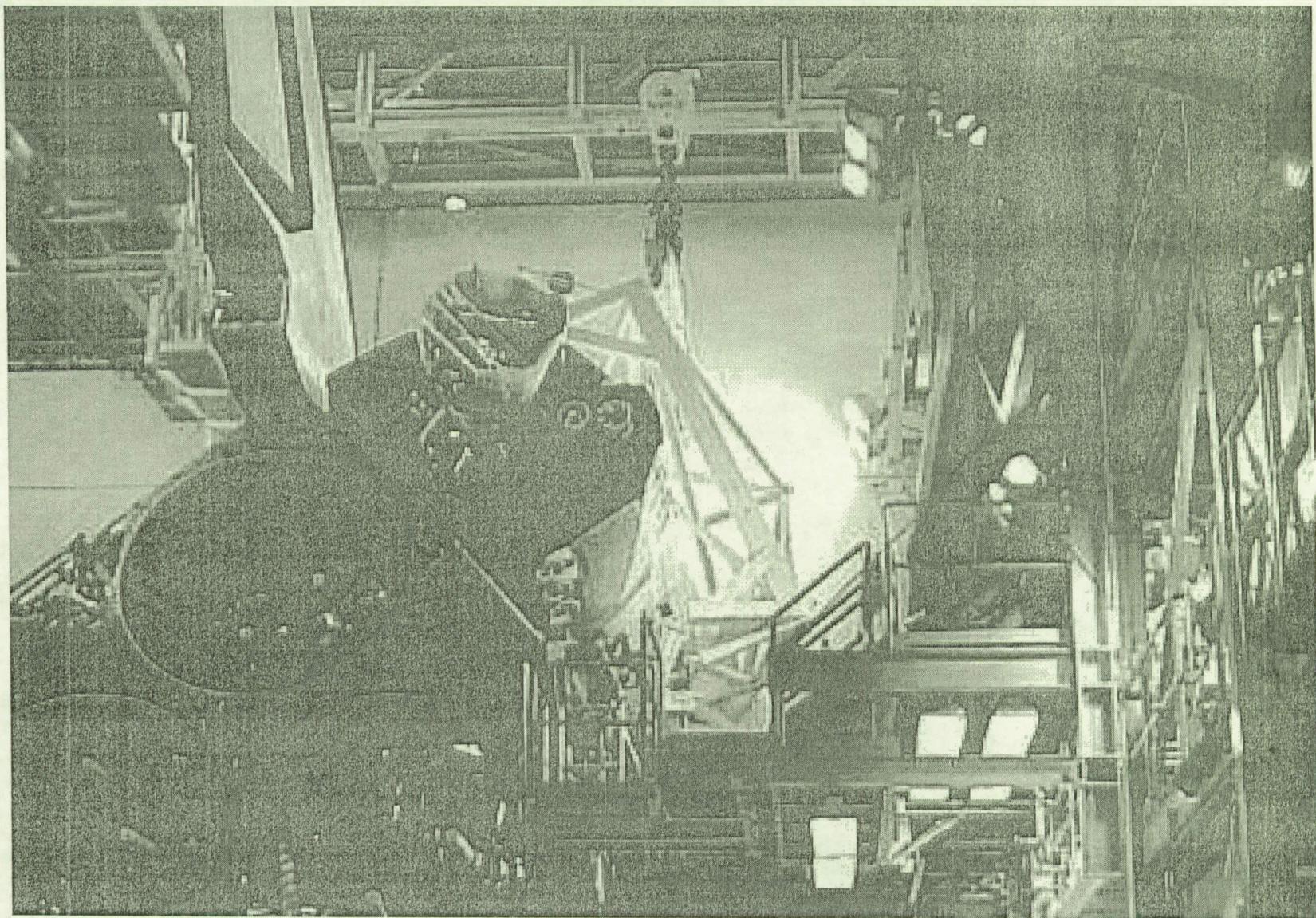


# Single Crane Lifts

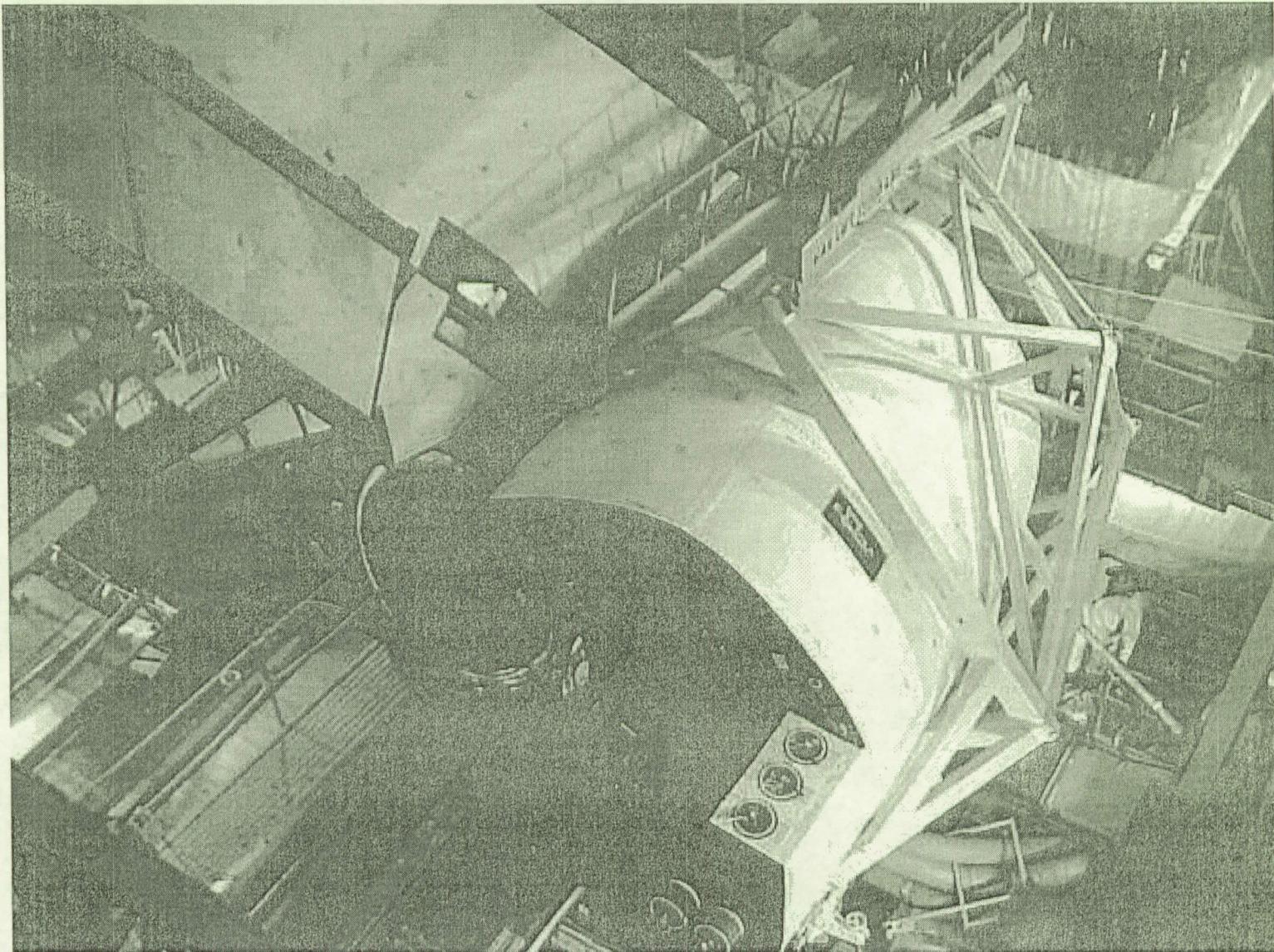
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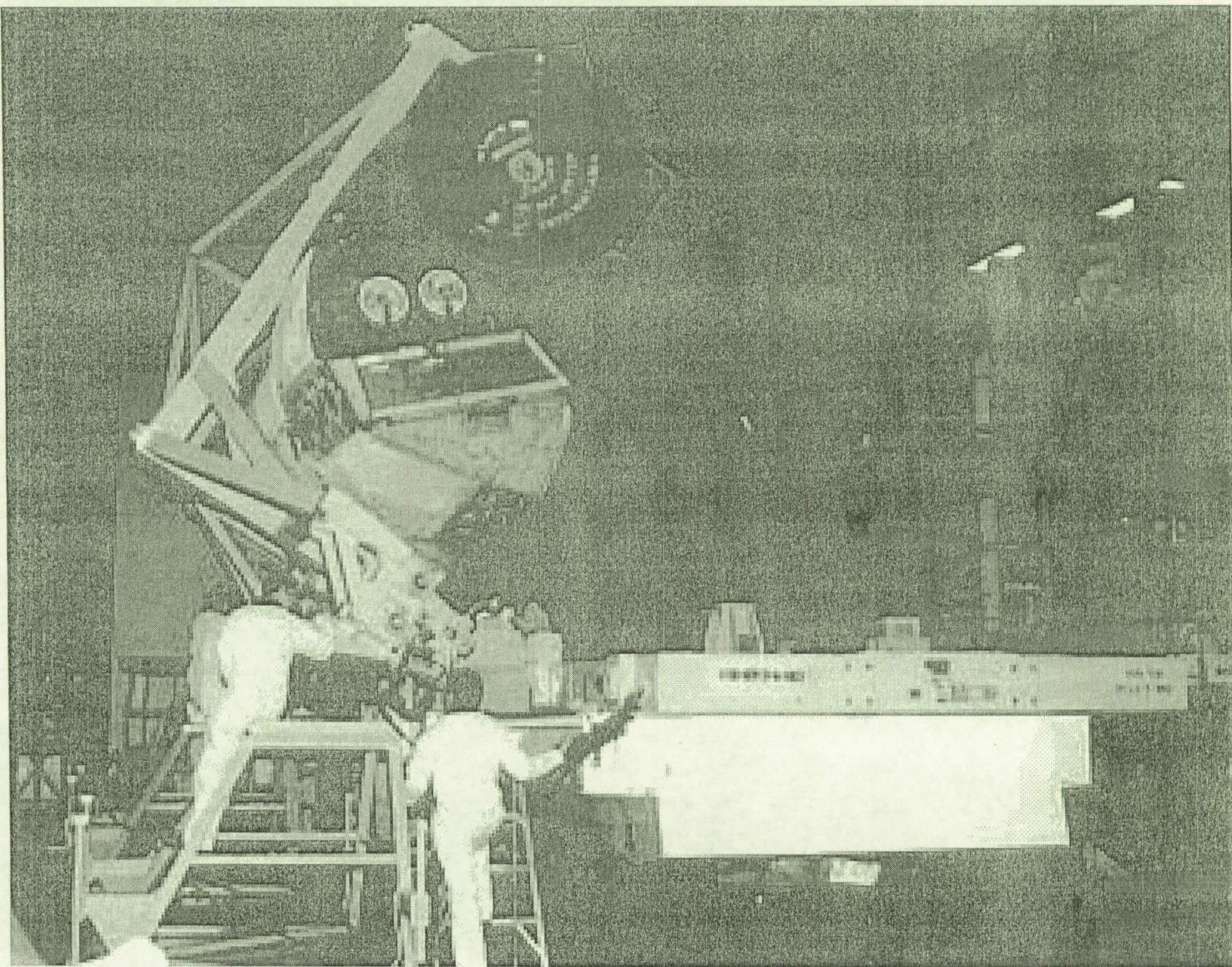
# Single Crane Lifts



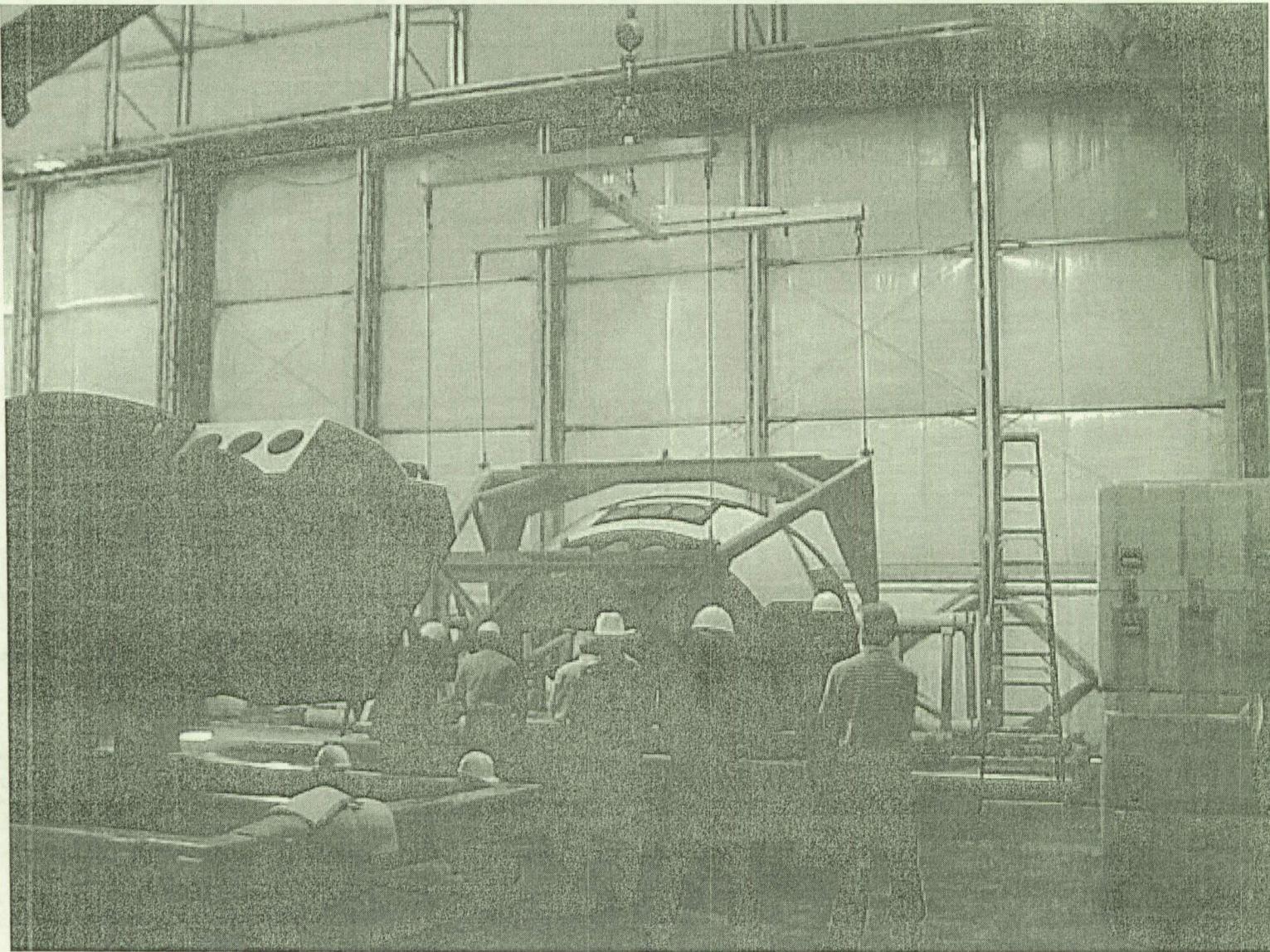
# Single Crane Lifts



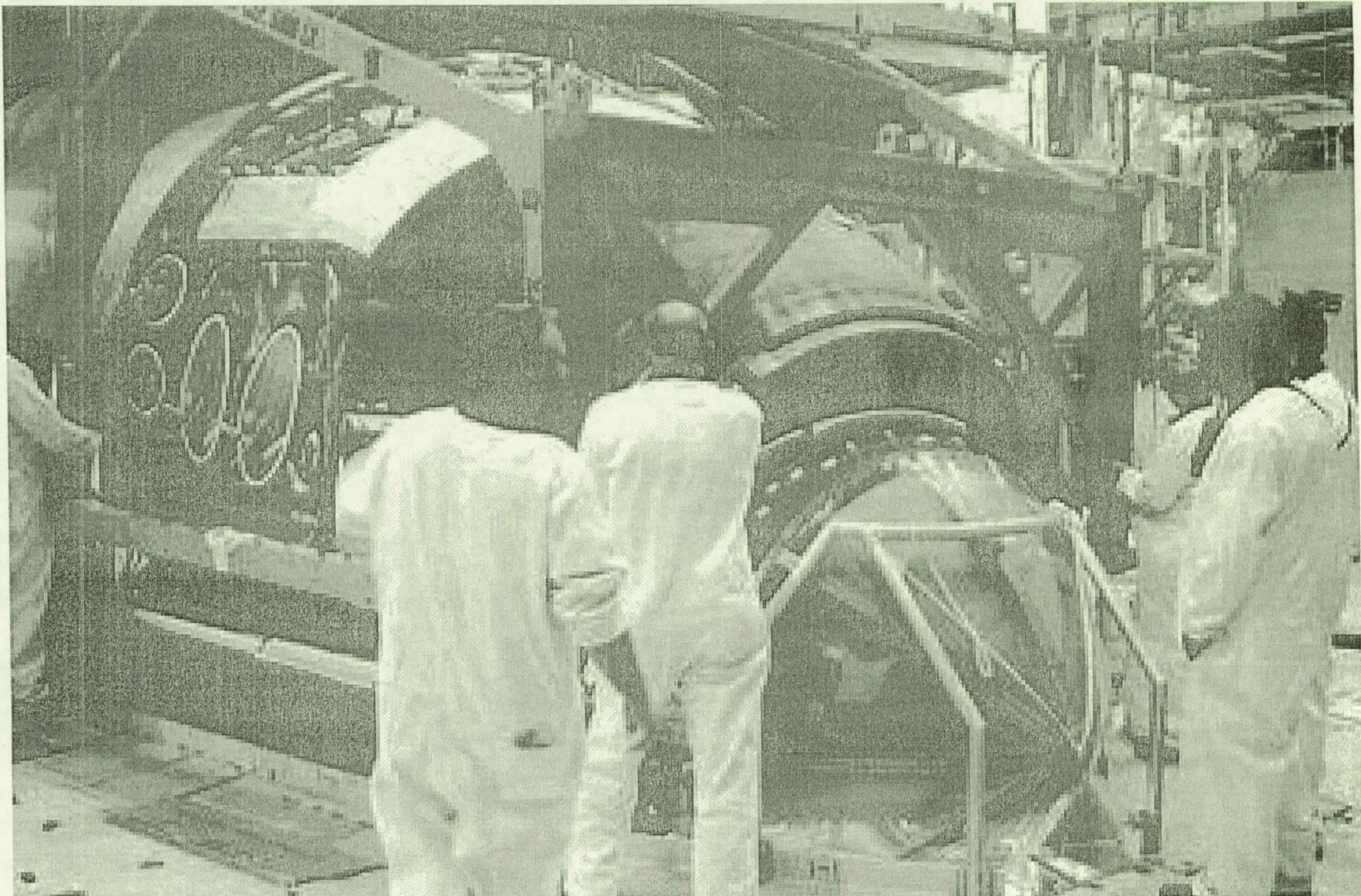
# Single Crane Lifts



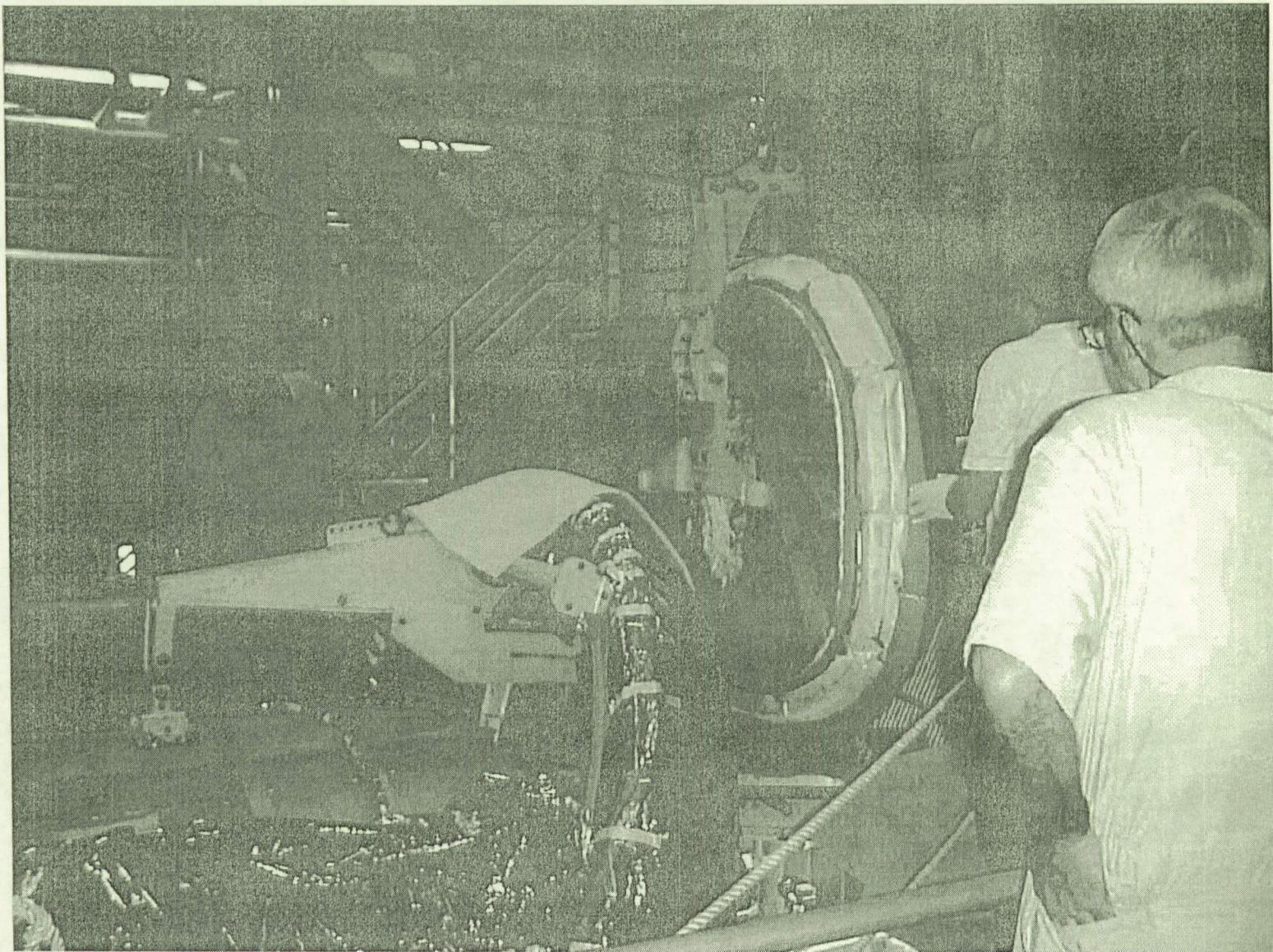
# Single Crane Lifts



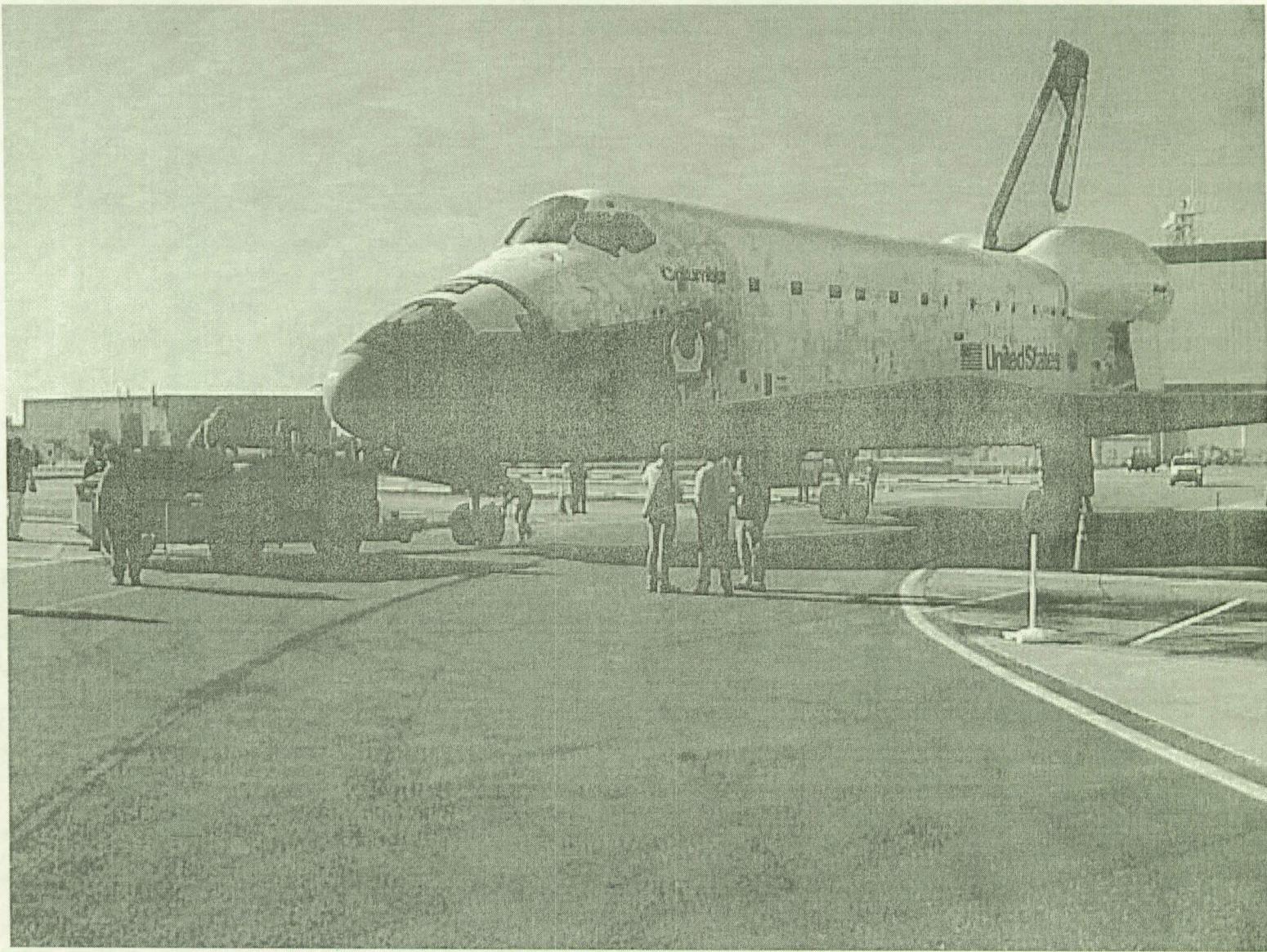
# Single Crane Lifts



# Single Crane Lifts



# Transportation



# Transportation

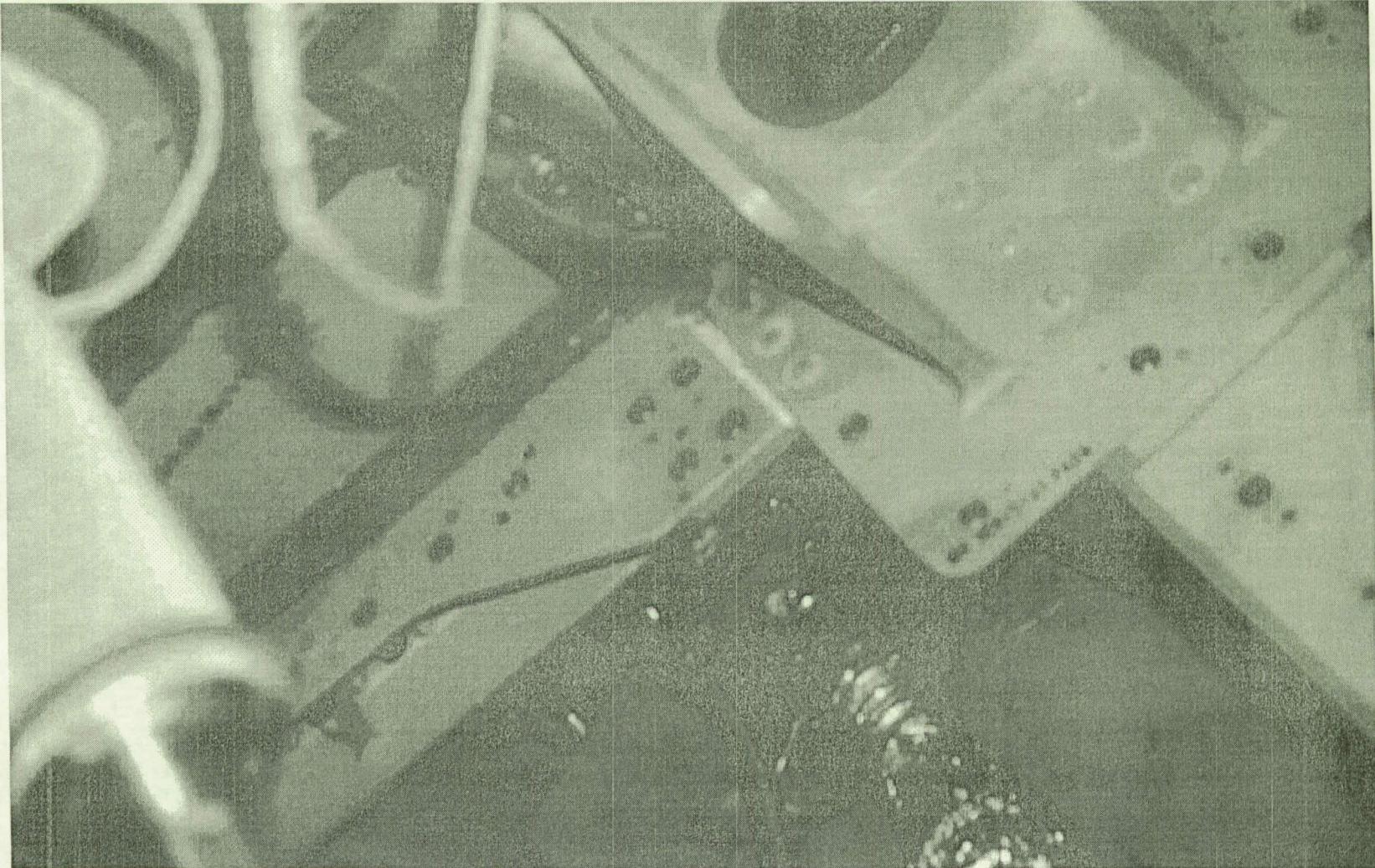
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# Issues and Incidents

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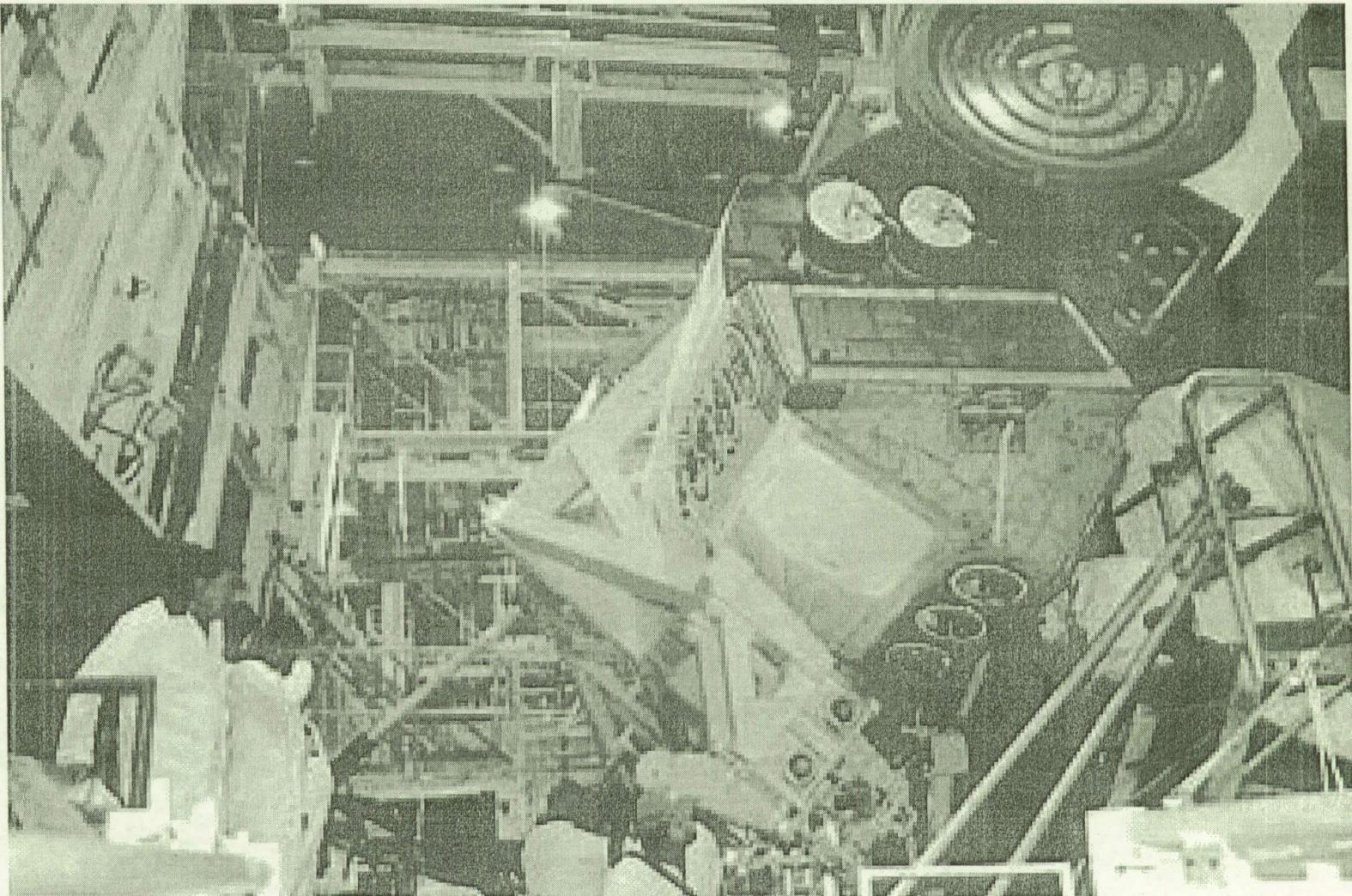
- Observers - Cracked OMS pod line



# Issues and Incidents

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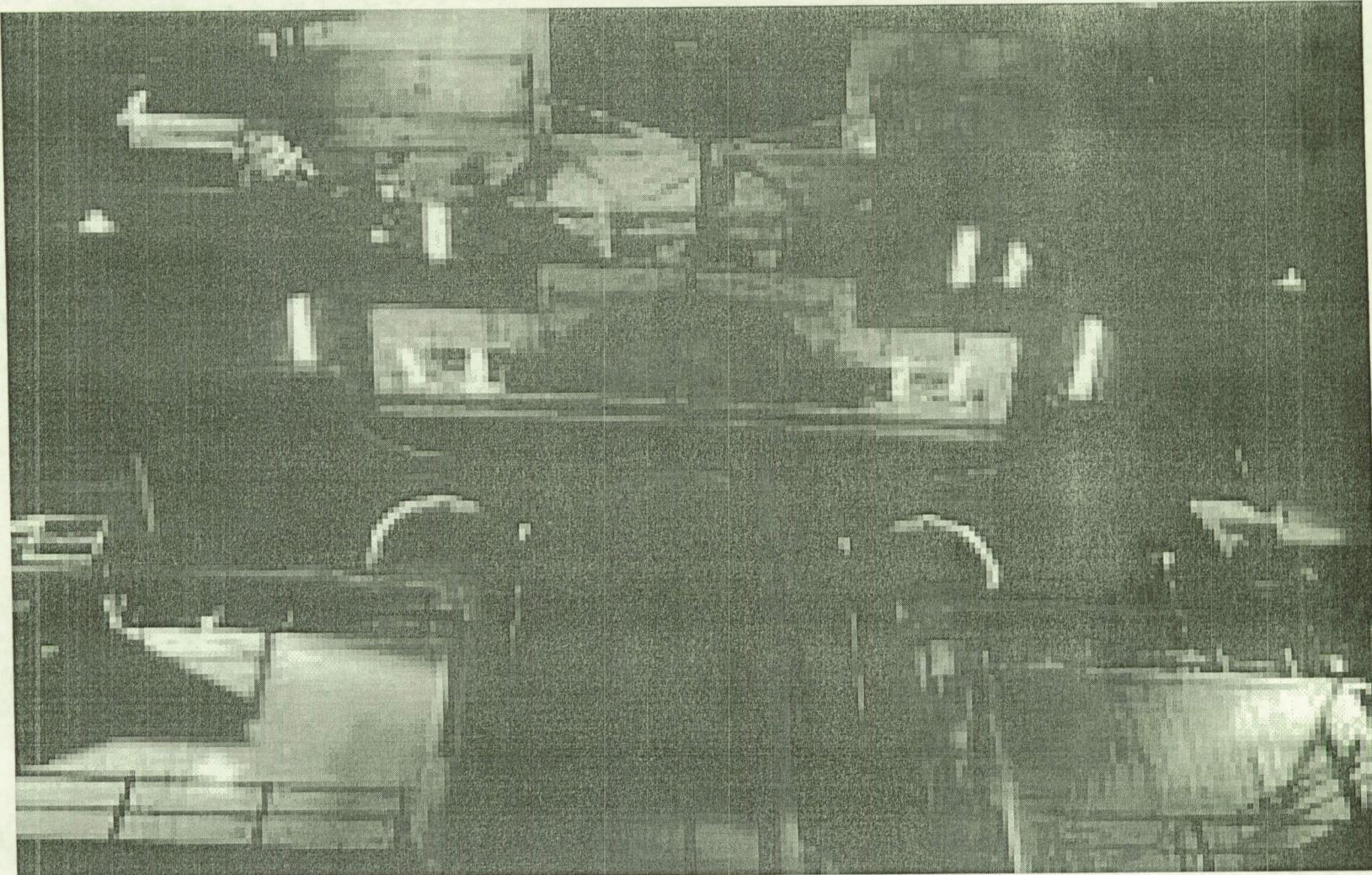
- Unfamiliarity with equipment - Bent OMS pod rotator



# Issues and Incidents

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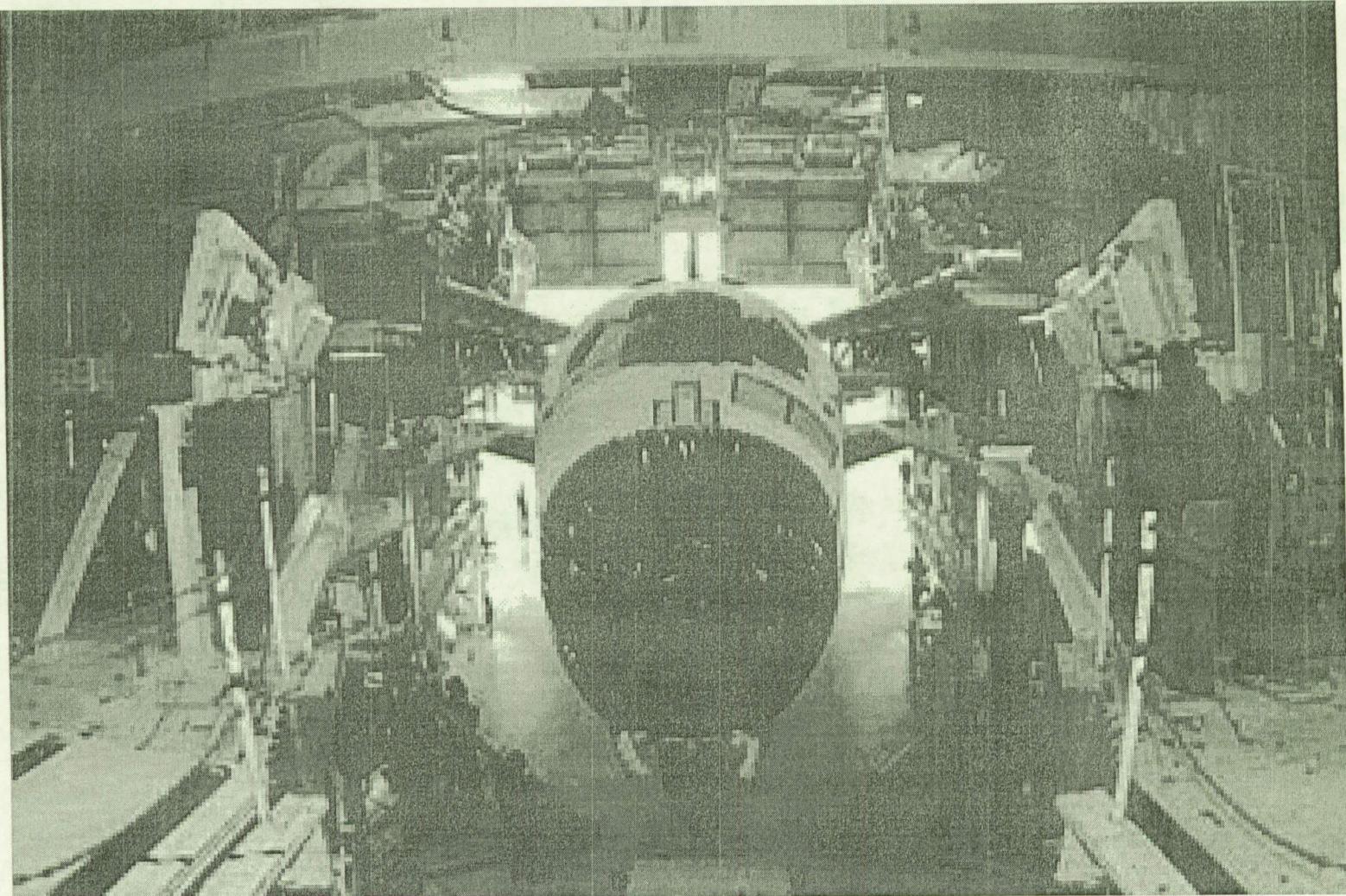
- Infrequent tasks - External tank contacted solid rocket booster



# Issues and Incidents

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- Communication issues - Orbiter tail hit a platform



# Policies

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- Operating Procedure
  - Guidelines for moving flight hardware and critical ground support equipment
  - Outlines function of move directors
    - Pre-task briefings
    - Assigning personnel
    - Communication
    - Emergency procedures
  - Use of hydra-set and crane scales
  - Requirements to include in procedures
  - Definitions

# Move Director Oversight and Guidance Committee

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- Team of experienced move directors, managers and engineers
- Independent reviews of move related incidents
- Proficiency and training of move directors
  - Limited numbers of move directors
  - Review training requirements
  - Conduct move director stand-boards
- Maintains move director website
  - Suggestions, problems and questions are assigned to the committee
  - Lessons learned are posted
  - Move directors can record moves performed
  - Links to all move directors and/or their managers
- Identify and resolve systemic problem in handling processes
- Seek improvements for handling procedures, safety and policies

# **Move Director Proficiency and Training**

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- Perform each task several times with certified move director
- Limit number of move directors certified for different tasks
- Two year re-certification program
- Review of infrequently performed procedures
- Intangible qualities
  - Ability to communicate
  - Ability to instruct/train
  - Ability to look ahead
  - Ability to lead and direct team
  - Earn of respect among team members

# Questions

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